REMARKS

Claims 18 – 23 are pending in the current matter. Claims 1 – 17 were previously cancelled, without prejudice. The office action issued by the Examiner and the citations referred to in the office action have been carefully considered.

ENABLEMENT REJECTION - 35 U.S.C. § 112

Claims 18 and 20 stand rejected for failure to comply with the enablement requirement. The applicant presents amended claims herein believed to cure the Examiner's rejection. Specifically, the phrase "relative movement of the surfaces" is hereby removed from the claim to expedite prosecution.

INDEFINITENESS REJECTION - 35 U.S.C. § 112

Claim 18 and 20 stand rejected for failure to particularly point out and distinctly claim the subject matter. The Examiner rejects claims 18 and 20 over 4 phrases that the Examiner contends do not particularly point out and distinctly claim the subject matter of the instant application.

Indefiniteness Rejection — Stationary vs. Moving Surfaces — Claims 18 & 20

First, the Examiner suggests that a surface resolve the scope of a surface that is both "stationary" and "moveable." The applicant has amended the claim to eliminate the reference to movement of the surfaces rendering the Examiner's rejection moot.

Indefiniteness Rejection — Boundary Layers and Surfaces — Claims 18 & 20

Second, the Examiner points out that the claim element relating to boundary layers and the surfaces on which they abut is unclear. For the purposes of clarity the applicant amended the claims. As the relevant clause in both claim 18 and claim 20 currently reads, the first and second materials each form a boundary layer against one of

the two surfaces. Naturally, with only two surfaces, only two possibilities exist with respect to which surface the boundary layer of each material forms on.

As interdiffusion or reaction occurs, both the first and second boundary layers change into the resultant layers and continue to be boundary layers against the two surfaces. Thus, both the first boundary layer and the second boundary layer become resultant layers. As such, first boundary layer and second boundary layer, as well as resultant material are layers against one of the two surfaces, albeit at different points in the process.

Indefiniteness Rejection — Radial Spacing — Claims 18 & 20

Third, the Examiner suggests that with respect to radial spacing, no other geometry exists in the claim upon which a determination of a radial vector may be constructed. The applicant has removed the references to radial so as to render the Examiner's argument moot and as a courtesy to advance prosecution.

Indefiniteness Rejection — Scope of "Flow Rates" — Claims 18 & 20

Fourth, the scope of "flow rates" in lines 16-17 of claim 18 and 20 stand rejected as indefinite. The Examiner seeks to have the applicant define a numerical or formulaic determination of the flow rate. The Applicant, however, respectfully disagrees with the Examiner's characterization with respect to flow rate. While it is true that there exists a differential shear throughout the channel through which the boundary layer flows, this shear is inconsequential with respect to the claimed process because only the shear between the respective boundary layers is germane to the claim.

Simply stated, in lines 16-17, the applicant is merely claiming that the flow rate must be sufficient to maintain laminar flow throughout the device. Laminar flow for both boundary layers will produce the requisite laminar sheer of the value required from interdiffusion. Depending on the given material, the flow rate will vary. For example, for a gas to remain laminar in a channel, it must flow much faster through the channel than

a viscous fluid. That rate can be determined without undue experimentation, and is likely to be known for many materials.

The fact that the flow rate is not defined by a number or formula does not automatically render the claim language indefinite. *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818 (Fed. Cir. 1984). Here, the flow rate required to produce laminar flow is measurable against the standard for producing laminar flow in a given material. *Ex Parte Brummer*, 12 U.S.P.Q. 1653 (Bd. Pat. App. & Inter. 1989).

To expedite prosecution, claim 18 is amended to reflect the foregoing discussion. However, the Applicant believes the original claims to be definite to a person of ordinary skill in the art. As such, claim 20 remains unamended to reflect the Applicant's belief that the original claim is definite and requires no amendment to overcome the Examiner's rejection.

Claim Interpretation — Broad Scope

The Examiner objects to the term "high-shear mixing" in the preamble of the claims. As a courtesy to the Examiner, the preamble of the claims have been amended to remove the offending language.

Claim Rejection — 35 U.S.C. § 102(e) — Claim 19

Claim 19 stands rejected under 35 U.S.C. § 102(e) as anticipated by Horner et al. To overcome an anticipation rejection, the applicant need only demonstrate that the references fail to teach each and every claimed limitation. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). The instant application describes an apparatus wherein the spacing between two surfaces is designed to be approximately the same as the back-to-back thickness of the laminar boundary layer of the first material and the laminar boundary layer of the second material. The "static mixers" disclosed by paragraph [0004] of Horner et al "**cause a successive geometric layering effect" of viscous materials through the use of baffles.**

The teachings of the present disclosure requires flow rates enough to subject the materials to laminar flow and consequently shear. Specifically, the flow should ideally be over 5 meter per second. See claim 19, lines 18-20 and paragraph [0017]. According to Horner, "[t]he mix method is largely independent of fluid speed." The device disclosed in Horner, is designed to be used with viscous materials that are laminar by nature. Horner teaches a mixing system for mixing viscous materials by creating thin layers of each material. At a certain "thinness," the liquid components of the viscous material will interdiffuse between the layers. As explained in Horner, turbulent flow is difficult to produce in viscous materials requiring a mixing technique for materials that tend to stay laminar. To that end, the Horner apparatus comprises numerous baffles that create "thin" slices of viscous materials, which then allows complete interdiffusion without the need for turbulent flow.

The applicant's disclosure contains no baffle system. It is designed to be used for materials that can be accelerated to a speed that produces laminar flow and a shearing effect at the border between two materials to be mixed, which causes an increased rate of interdiffusion. These **claimed elements are neither found nor suggested by Horner** because Horner addresses a completely different problem than the applicant's disclosure, that is, the mixture of extremely viscous materials.

Thus, Horner fails to teach each and every claimed limitation. Consequently, the Applicant respectfully submits that the Examiner's rejection under 35 U.S.C. § 102(e) is traversed and the rejection must be withdrawn. Indeed, Horner et al. teaches that relatively little energy input is required to drive mixing. The applicant's invention, however, requires that the streams of flow material exceed a specific velocity, suggesting that these methods embody similar principle (that of interdiffusion), while performing the functions in a unique manner. Horner reinforces this principle by addressing only the problem of the difficulty in mixing highly viscous materials that fail to efficiently mix with the use of conventional mixing methods.

Claim Rejections — 35 U.S.C. §§ 102 and 103 — Claim 19

Claim 19 stands rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Yager et al. In the first instance, the Applicant's disclosure and Yager are not identical inventions. To be successfully applied, "the identical invention must be shown in as complete detail as is contained in the . . . claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236 (Fed. Cir. 1989). Here, the device comprises an inner casing contained within an outcasing. The space between the inner casing and the outer casing forms an annular channel, where the space is maintained using joist members. Although the principles of operation are similar in Yager and the applicant's disclosure, the devices are different. Yager's channels are formed by creating microfluidic channels, not with channels defined by larger physical members where space is maintained by a joist system.

Yager teaches a **microfluidic device** for mixing. The claims do not disclose a size range. Nevertheless, in such cases the specification may be used to determine the meaning of terms used in the claims. *Toro Co. v. White Concol. Industries, Inc.*, 199 F.3d 1295, 1299 (Fed. Cir. 1999), *Renishaw PLC v. Marposs Societa per* Azioni, 158 F.3d 1243, 1250 (Fed. Cir. 1998). The **present disclosure teaches a device that has a mixing channel in the millimeter range** of thickness. *See* Paragraph [0016]. Conversely, **Yager is directed to a microfluidic device**. Thus, these are not identical devices. The device of Yager is not an identical invention to that of the Applicant's disclosure. A rejection under § 102(b) is therefore inappropriate.

Regarding the Examiner's 35 U.S.C. § 103(a) rejection for being obvious over Yegar et al., the Applicant respectfully disagrees with the Examiner's result. The Examiner asserts that applicant's invention is obvious, yet fails to set forth a *prima facie* case of obviousness. As the PTO has the burden to do so, the rejection must be reconsidered. *In re Dillon* (citation omitted).

Specifically, the Examiner has the burden to show some suggestion or motivation to modify Yager to produce the apparatus claimed by the Applicant. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). The Examiner correctly discusses the similarities of the principles of operation of the devices. Naturally, because both devices are designed to produce interdiffusion type mixing. However, **these devices differ in their respective scales by orders of magnitude**. A microfluidic device inherently solves problems that must be addressed for similar inventions on a macroscale. For example, preventing turbulent flow in Yager is simply a matter of producing sufficiently small channels. Conversely, in the present disclosure, a channel of much greater thickness is formed, requiring the applicant to determine how to preserve laminar flow. Yager contains no description, suggestion, or motivation in solving this problem or that the microfluidic device would be applicable on a larger scale. Indeed, the Examiner must consider the secondary consideration of why the devices was produced first on a microfluidic scale. The most logical explanation is that the specific problems inherent on a macroscale were unresolved prior to the filing of the Applicant's application.

Indeed, Yager teaches away from the present disclosure. The first paragraph of the Detailed Description explains why larger devices are not used in Yager: "to separate smaller particles from larger particles in a sample stream based on the fact that the diffusion coefficient of a particle is substantially inversely proportional to the size of the particle so that larger particles diffuse more slowly than smaller particles, the fact that diffusion occurs more quickly at the microscale of this invention than in large scale separation devices. . . ." A person of ordinary skill in the art would not by motivated given these arguments.

The Examiner's argument with respect to flow rates is addressed above. The applicant submits that the Examiner's argument in this respect has been successfully addressed and traversed. Moreover, it is unclear how the Examiner can claim the offending language is indefinite in scope, but also reject it as obvious without first having an appreciation of the scope of the claim. Thus, the Applicant respectfully

submits that both the indefiniteness rejection and the obviousness rejection based on the language related to flow rate cannot concurrently stand.

Consequently, the Examiner's arguments do not explain to state how the system of Yager would motivate or suggest to a person of skill in the art to modify the Yager system to form the Applicant's device. The apparatus of Yager is built on a microscale, where the flow of two materials remain laminar due to the extremely small size of the channel, where the applicant had to resolve how to preserve laminar flow and induce intermixing on a scale over 1000 times larger by the use of rapidly flowing flow material. As such, the Examiner's rejection under 103(a) cannot stand and should be withdrawn as a matter of law. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991).

Claim Rejection — Double Patenting — Claims 18 & 20

The Examiner points to features of overlap between the Applicant's present application and Applicant's patent number 6,471,392. Claims that differ from each other (aside from minor differences in language, punctuation, etc.), whether or not the difference would have been obvious, are not considered to be drawn to the same invention for double patenting purposes under 35 U.S.C. 101. MPEP § 802.04(II). The claims of the Applicant's present disclosure compared to that of his previously issued patent omits a key limitation present in the issued patent, i.e., the presence of rotating surfaces relative to each other has been eliminated. Indeed, the Applicant's discovered a method and apparatus that does not required the surfaces to move at all. Instead, the surfaces of the present disclosure are "stationary" with respect to each other.

The problems solved by rotating the surfaces are also solved through the use of high velocity flow materials. However, this modification is neither suggested nor taught in patent number 6,471,392, which precludes the present disclosure from being an obvious variant of the issued patent.

Thus, the key issue is whether the claimed inventions are distinct. As such, the Examiner has the burden to show why the invention of the present disclosure is an obvious variant of the invention defined in the patent. The MPEP requires the Examiner to make clear to the Applicant, in addition to differences of the claims, **why a person of ordinary skill in the art would conclude that the present disclosure is merely an obvious variant**. To do so requires the Examiner to determine the level of ordinary skill in the art and apply that level to the differences noted in the claims.

> Any obviousness-type double patenting rejection should make clear:
>
> (A) The differences between the inventions defined by the conflicting claims - a claim in the patent compared to a claim in the application; and
>
> (B) The reasons why a person of ordinary skill in the art would conclude that the invention defined in the claim **>at issue would have been< an obvious variation of the invention defined in a claim in the patent. MPEP 804(II)(B)(1).

While the Examiner clearly points out the common subject matter between the claims of the application and the Applicant's prior patent, there is no discussion of the differences between the claims or why a person of ordinary skill in the art would consider the differences to be mere variations. Consequently, it is difficult for the Applicant to evaluate the merits of a double patenting rejection here in making a decision whether to file a terminal disclaimer or traverse the rejection. The applicant respectfully requests that **the Examiner either withdraw the double patent rejection** in light of the Applicant's arguments and the lack of evidence cited by the Examiner describing why the present disclosure is merely an obvious variant of the prior patent.

It is respectfully submitted that all of the Examiner's rejections and objections have been successfully traversed and that the application is now in order for allowance. Accordingly, reconsideration of the application and allowance thereof is courteously solicited.

Respectfully submitted,

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